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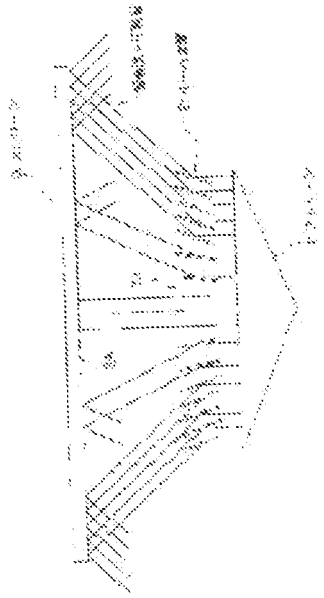
(54) ORIENTATION ANGLE CONTROL METHOD FOR ULTRASONIC SPEAKER, ULTRASONIC SPEAKER SYSTEM, AND LOUVER APPARATUS



(57)Abstract.
PROBLEM TO BE SOLVED: To converge or diffuse reproduced sounds in accordance with the situation of listening to the reproduced sounds.
SOLUTION: In an ultrasonic speaker 1 wherein a carrier wave is modulated by a signal wave outputted from a signal source for generating a signal wave of an audible frequency band and an ultrasonic transducer is driven by the modulated signal to reproduce a signal sound of the audible frequency band, a plurality of louvers 20A, 20B are integrally provided on a front face of a speaker body to reflect the reproduced sounds in any one of or in both vertical and horizontal directions, and angle adjustment knobs 27A, 27B are included to change each setting angle of the plurality of louvers to converge or diffuse the reproduced sounds in accordance with the situation of listening to the reproduced sounds.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
This invention relates to the angle-of-beam-spread control method, the ultrasonic wave speakers, *ultrasonic loudspeaker system, and louver device of the ultrasonic wave*

speakers using a strong directive ultrasonic transducer.
[Background of the Invention]
[0002]
It is known that the signal of the audio frequency belt in which the ultrasonic wave speakers using the nonlinearity of the medium (air) to an ultrasonic wave have far sharp directivity from the former compared with the usual loudspeaker can be reproduced (for example, refer to patent documents 1.).
The composition of the conventional ultrasonic wave speakers is shown in drawing 6. In the figure, ultrasonic wave speakers have the source 51 of an audio frequency wave oscillation which generates the signal of an audio frequency belt, the source 52 of a carrier wave oscillation which generates a carrier wave, the modulator 53, the power amplification 54, and the ultrasonic transducer 55.
[0003]
In the above-mentioned composition, the carrier wave of the ultrasonic frequency belt outputted from the source 52 of a carrier wave oscillation by the signal wave outputted from the source 51 of an audio frequency wave oscillation is modulated with the modulator 53, and the ultrasonic transducer 55 is driven with the modulating signal amplified with the power amplification 84. As a result, the above-mentioned modulating signal is changed into the sound wave of a finite amplitude level by the ultrasonic transducer 55, this sound wave is emitted into a medium (inside of the air), and the beep of the original audio frequency belt is reproduced by the nonlinear effect of a medium (air).
In this case, the reproduction range of the regenerative signal of an audio frequency belt turns into a beam shape range from the ultrasonic transducer 55 to discharge shaft orientations. Here, both the distance which a regenerative signal reaches, and the beam width (beam radiation angle) of an ultrasonic beam are included in the direction of a radial axis from the sound radiation side of an ultrasonic transducer with "the reproduction range of a regenerative signal."
[0004]
Here, the composition of the ultrasonic transducer currently used for the conventional ultrasonic wave speakers is shown in drawing 7. The resonance type with which the piezoelectric ceramic was used for the conventional ultrasonic transducer (or oscillation transducer) as a vibration element is almost the case. The ultrasonic transducer shown in drawing 7 performs both conversion for an ultrasonic wave from an electrical signal, and conversion (transmission and reception of an ultrasonic wave) to an electrical signal from an ultrasonic wave, using a piezoelectric ceramic as a vibration element. The bimorph type ultrasonic transducer shown in drawing 7 (A) comprises the piezoelectric ceramics 61 and 62 of two sheets, the corn 63, the case 64, the leads 65 and 66, and the screen 67.
[0005]
The piezoelectric ceramics 61 and 62 are stuck mutually, and the lead 65 and the lead 66 are connected to the lamination side and field of an opposite hand, respectively.
On the other hand, the uni-morph type ultrasonic transducer shown in drawing 7 (B) comprises the piezoelectric ceramic 71 of one sheet, the case 72, the leads 73 and 74, the internal wiring 75, and the glass 76. The piezoelectric ceramic 71 is grounded by the case 72 while the lead 73 is connected via the internal wiring 75.
Since the resonance type ultrasonic transducer uses the resonance phenomena of a

piezoelectric ceramic, it becomes good [the characteristic of transmission of an ultrasonic wave. and reception] in the comparatively narrow frequency band of the resonance frequency circumference.
[0006]
Next, the concrete composition of the broad frequency band oscillation type ultrasonic transducer of an electrostatic type is shown in drawing 8. The dielectrics 131 (insulator). such as PET (polyethylene rente REFUKURETO resin) about 3-10 micrometers thick, are used for the ultrasonic transducer of the electrostatic type shown in drawing 8 as a vibration body. While the upper electrode 132 formed as metallic foils, such as aluminum, is really formed in the upper face part by processing of vacuum evaporation etc. to the dielectric 131, it is provided so that the lower electrode 133 formed by brass may contact the undersurface part of the dielectric 131. This lower electrode 133 is being fixed to the base plate 135 which consists of bakelite etc. while the lead 152 is connected.
[0007]
The lead 153 is connected to the upper electrode 132.
This lead 153 is connected to the DC bias power supply 150.
The DC bias voltage for upper electrode adsorption of an about [50-150V] is always impressed to the upper electrode 132 by this DC bias power supply 150, and the lower electrode 13 side is adsorbed in the upper electrode 32. 11 is an AC signal source and equivalent to the output (AC50 - 150 ****-p) of the power amplification 54 in drawing 6. The dielectric 11, the upper electrode 12, and the base plate 15 are closed in the case 130 with the metal rings 136, 137, and 138 and the mesh 139.
[0008]
Two or more tens which have uneven shape - minute slots of about 100 micrometers of numbers are formed in the field by the side of the dielectric 131 of the lower electrode 133. Since this minute slot serves as an opening between the lower electrode 133 and the dielectric 131, distribution of the electric capacity between the upper electrode 132 and the lower electrode 133 changes minutely. This random minute slot is formed by damaging the surface of the lower electrode 133 with a file manually. In the ultrasonic transducer of the electrostatic method, by forming the countless capacitor by which it does in this way and the size of an opening differs from the depth, as the frequency characteristic of an ultrasonic transducer shows drawing 9 to the curve Q1, it is a broadband.
[0009]
At the ultrasonic transducer 55 of the above-mentioned composition, where DC bias voltage is impressed to the upper electrode 132, a modulating signal (output of the power amplification 54) is impressed between the upper electrode 132 and the lower electrode 133. Incidentally, as the curve Q2 shows to drawing 9, the frequency characteristic of a resonance type ultrasonic transducer is 40 kHz in center frequency (resonance frequency of a piezoelectric ceramic).
It is [in / to the center frequency used as maximum sound pressure / the frequency of **5 kHz] -30 dB to maximum sound pressure.
On the other hand, the frequency characteristic of the broadband oscillation type ultrasonic transducer of the above-mentioned composition is flat to near 40 kHz to 100 kHz, and is about **6 dB as compared with maximum sound pressure in 100 kHz.
[Patent documents 1] JP,58-119293,A

[Description of the Invention]
[Problem(s) to be Solved by the Invention]
[0010]
As an ultrasonic transducer used for ultrasonic wave speakers, Although either a resonance type ultrasonic transducer (drawing 7) or the ultrasonic transducer (drawing 8) of an electrostatic method is OK, it is desirable that a reproduced sound reaches beam shape to a distance with sharp directivity in the ultrasonic wave speakers which have directivity.
However, in order to use it as loudspeakers, such as a projector for home theaters, it is desirable that a reproduced sound can be diffused somewhat spatially according to the situation which a reproduced sound hears.
[0011]
This invention is made in view of such a situation, and is a thing.
It is providing the angle-of-beam-spread control method, the ultrasonic wave speakers, ultrasonic loudspeaker system, and louver device of the target ultrasonic wave speakers which can respond to a situation, and can converge or diffuse a reproduced sound.

[Means for Solving the Problem]
[0012]
The invention according to claim 1 modulates a carrier wave by a signal wave outputted from a signal source which generates a signal wave of an audio frequency belt, In an angle-of-beam-spread control method of ultrasonic wave speakers which reproduce a beep of an audio frequency belt by driving an ultrasonic transducer with this modulating signal, It changes so that two or more louvers which reflect a sound wave in any 1 direction or both directions among a perpendicular direction in a front face of said ultrasonic wave speakers and a horizontal direction may be installed, each set angle of a louver of this plurality may be responded to a situation of hearing said reproduced sound and a reproduced sound may be converged or diffused.
[0013]
In an angle-of-beam-spread control method of the ultrasonic wave speakers according to claim 1, the invention according to claim 2 said two or more louvers, Consisting of the 1st louver group installed in a perpendicular direction in a front face of ultrasonic wave speakers, and the 2nd louver group in a front face of ultrasonic wave speakers installed horizontally, said 1st and 2nd louver group enabled adjustment of a set angle independently, respectively.
[0014]
As for the invention according to claim 3, in an angle-of-beam-spread control method of ultrasonic wave speakers given in either of claim 1 or 2, said two or more louvers are installed in a peripheral part from near the center of a front face of ultrasonic wave speakers.
[0015]
As for the invention according to claim 4, in an angle-of-beam-spread control method of the ultrasonic wave speakers according to any one of claims 1 to 3, all of a set angle of two or more of said louvers are set as an identical angle.
[0016]
In an angle-of-beam-spread control method of the ultrasonic wave speakers according to

any one of claims 1 to 3, the invention according to claim 5 a set angle of two or more of said louvers, You made it differ by louver installed in a part near near the center of a front face of ultrasonic wave speakers, and a louver installed in the other part.
[0017]
The invention according to claim 6 modulates a carrier wave by a signal wave outputted from a signal source which generates a signal wave of an audio frequency belt. They are ultrasonic wave speakers which reproduce a beep of an audio frequency belt by driving an ultrasonic transducer with this modulating signal. Two or more louvers which reflect said reproduced sound in a perpendicular direction and any 1 horizontal direction, or both directions are provided in a front face of a loudspeaker body in one, It has an adjustment device changed so that each set angle of two or more of said louvers may be responded to a situation of hearing said reproduced sound and a reproduced sound may be converged or diffused.
[0018]
In the ultrasonic wave speakers according to claim 6, the invention according to claim 7 said two or more louvers, Consisting of the 1st louver group installed in a perpendicular direction in a front face of ultrasonic wave speakers, and the 2nd louver group in a front face of ultrasonic wave speakers installed horizontally, said 1st and 2nd louver group has an adjustment device which adjusts a set angle independently, respectively.
[0019]
A louver of the ultrasonic-wave-speakers aforementioned plurality [invention / according to claim 8] given in either of claim 6 or 7 is installed in a peripheral part from near the center of a front face of ultrasonic wave speakers.
[0020]
As for the invention according to claim 9, in the ultrasonic wave speakers according to any one of claims 6 to 8, a set angle of two or more of said louvers is altogether set as an identical angle by said adjustment device.
[0021]
In the ultrasonic wave speakers according to any one of claims 6 to 8, the invention according to claim 10 a set angle of two or more of said louvers, It is set up differ by louver installed in a part near near the center of a front face of ultrasonic wave speakers by said adjustment device, and a louver installed in the other part.
[0022]
The invention according to claim 11 modulates a carrier wave by a signal wave outputted from a signal source which generates a signal wave of an audio frequency belt. Ultrasonic wave speakers which reproduce a beep of an audio frequency belt by driving an ultrasonic transducer with this modulating signal Two sets, Are stored in one case up and down, and counter this front face of a case at each ultrasonic wave speakers, and two or more louvers are installed, and, respectively by two sets of said ultrasonic wave speakers. An audible signal of a different channel is reproduced, respectively and said two or more louvers, It consists of the 1st louver group installed in a perpendicular direction in a front face of ultrasonic wave speakers, and the 2nd louver group in a front face of ultrasonic wave speakers installed horizontally, and has an adjustment device which adjusts independently a set angle of said 1st and 2nd louver group, respectively.
[0023]
This invention modulates a carrier wave by a signal wave to which the invention

according to claim 12 is outputted from a signal source which generates a signal wave of an audio frequency belt, A louver device installed in ultrasonic wave speakers which reproduce a beep of an audio frequency belt is characterized by comprising the following by driving an ultrasonic transducer with this modulating signal:
Two or more louvers which reflect a sound wave in any 1 direction or both directions among a perpendicular direction in a front face of said ultrasonic wave speakers, and a horizontal direction.
An adjustment device changed so that each set angle of a louver of this plurality may be responded to a situation of hearing said reproduced sound and a reproduced sound may be converged or diffused.

[Effect of the Invention]
[0024]
As explained above, according to the invention (the angle-of-beam-spread control method of ultrasonic wave speakers) according to claim 1 to 5, it responds to the situation of hearing the reproduced sound outputted from ultrasonic wave speakers, and the effect that this reproduced sound can be converged or diffused is acquired.
[0025]
According to the invention (ultrasonic wave speakers) according to claim 6 to 10, the effect that the ultrasonic wave speakers which can respond to the situation of hearing the reproduced sound outputted, and can converge or diffuse this reproduced sound are obtained is acquired.
[0026]
According to the invention (ultrasonic loudspeaker system) according to claim 11, the effect that the ultrasonic loudspeaker system which can respond to the situation of hearing the reproduced sound outputted, and can converge or diffuse this reproduced sound is obtained is acquired.
[0027]
According to the invention (louver device) according to claim 12, by using it, attaching to the front face of ultrasonic wave speakers, it responds to the situation of hearing the reproduced sound outputted from ultrasonic wave speakers, and the effect that this reproduced sound can be converged or diffused is acquired.
[Best Mode of Carrying Out the Invention]
[0028]
Hereafter, the embodiment of this invention is described in detail with reference to drawings. The composition of the ultrasonic wave speakers concerning the embodiment of this invention is shown in drawing 1. This embodiment shows the example applied to the projector for home theaters. Drawing 1 is the top view seen from the upper part of the screen 3. In drawing 1, the louver device 2 which consists of two or more louvers 20 is installed in the front face of the ultrasonic wave speakers 1.
The screen 3 with which an image is projected via the projection optical system which is not illustrated ahead of the ultrasonic wave speakers 1 which constitute the projector for home theaters is installed.
[0029]
The ultrasonic wave speakers 1 are the conventional ultrasonic wave speakers and identical configuration which are shown in drawing 6 mentioned already. That is, the

carrier wave of an ultrasonic frequency belt is modulated by the signal wave outputted from the signal source which generates the signal wave of an audio frequency belt, and it has a function which reproduces the beep of an audio frequency belt by driving an ultrasonic transducer with this modulating signal.
Although the louver device 2 has shown only what was horizontally installed in the front face of the ultrasonic wave speakers 1 by drawing 1, it is actually installed perpendicularly by the front face of the ultrasonic wave speakers 1 so that it may mention later.
[0030]
It is reflected by the louver 20 set as the predetermined angle by the angle adjusting means which is not illustrated, and is reflected in the front face 3A of the screen 3 located further ahead, and the beam shape beep (reproduced sound) emitted from the ultrasonic wave speakers 1 converges or diffuses a reproduced sound.
The relation between the set angle theta of a louver and angle-of-reflection theta' in the front face 3A of the screen 3 of a reproduced sound is shown in drawing 2.
[0031]
As shown in the figure, when the sound radiation side and the screen 3 of the ultrasonic wave speakers 1 are installed in parallel, it becomes the angle theta to the line segment which intersects perpendicularly with the sound radiation side and the screen 3 of the ultrasonic wave speakers 1 -- as -- a louver -- setting up (in this specification, theta is defined as the set angle of a louver.) -- angle-of-reflection theta' in the relation shown in drawing 2 to the screen 3,
theta'=(pi/2)-2theta
It becomes, therefore, the thing for which the set angle theta of the louver 20 is adjusted -- angle-of-reflection theta' in the front face 3A of the screen 3 of a reproduced sound -- if it puts in another way, the angle of beam spread of the ultrasonic wave speakers 1 is controllable. That is, if the set angle theta is made small, a beep can be completed and a reproduced sound can be conversely diffused by enlarging the set angle theta.
[0032]
Next, the appearance composition of the ultrasonic wave speakers 1 which the front face was horizontal and installed the louver device 2 perpendicularly is shown in drawing 3.
In the figure, the ultrasonic wave speakers 1 are stored by the case 30, and the louver device 2 is installed in the front face of the case 30. The 1st louver group 20A that consists of two or more louvers 2A installed in the perpendicular direction [in / in the louver device 2 / the front face of the ultrasonic wave speakers 1], Consist of the 2nd louver group 20B that consists of two or more louver 2Bs in the front face of the ultrasonic wave speakers 1 installed horizontally, and said 1st and 2nd louver group 20A and 20B, The set angle of the louver 2A and 2B can be independently adjusted now by operating the angle adjustment knobs 27A and 27B, respectively.
[0033]
Said 1st and 2nd louver group 20A and 20B is installed in the peripheral part from near the center of the front face of the ultrasonic wave speakers 1, respectively.
Each louver 2A which constitutes the 1st louver group 20A is stopped in the guide hole 23A established in the locking plate 22A by the engaging projection 201A which was supported by the axis 200A pivotable between the side plate 30A of the case 30, and 30B, and was formed in each louver 2A. The locking plate 22A is made to correspond to each

louver 2A, and it is formed so that the angle with the level surface which intersects perpendicularly with the sound radiation side of the ultrasonic wave speakers 1 to make may become large, as the guide hole 23A goes to a periphery along a perpendicular direction from near the center of the front face of the ultrasonic wave speakers 1.
[0034]
The rack 24A is fixed to the locking plate 22A, and the pinion gear 25A which engages with this rack 24A is being fixed to the end of the axis of rotation 26A. The axis of rotation 26A is supported by the bearing which is not illustrated to the side plate 30B of the case 30, and the angle adjustment knob 27A is being fixed to the other end of the axis of rotation 26A.
[0035]
Similarly, each louver 2B which constitutes the 2nd louver group 20B is stopped in the goide hole 23B established in the locking plate 22B by the engaging projection 201B which was supported by the axis 200B pivotable between the ceiling board 30C of the case 30, and the bottom plate 30D, and was formed in each louver 2B. The locking plate 22B is made to correspond to each louver 2B, and it is formed so that the angle with the vertical plane which intersects perpendicularly with the sound radiation side of the ultrasonic wave speakers 1 to make may become large, as the guide hole 23B goes to a periphery along a perpendicular direction from near the center of the front face of the ultrasonic wave speakers 1.
[0036]
The rack 24B is fixed to the locking plate 22B, and the pinion gear 25B which engages with this rack 24B is being fixed to the end of the axis of rotation 26B. The axis of rotation 26B is supported by the bearing which is not illustrated to the ceiling board 30C of the case 30, and the angle adjustment knob 27B is being fixed to the other end of the axis of rotation 26B.
Drawing 4 is a top view showing the structure which cut the center section of the front face of the ultrasonic wave speakers 1 in drawing 3 in the level surface.
In drawing 3, each louver 2A of the 1st and 2nd louver group 20A and 20B and 2B are in the state where it closed.
[0037]
If the angle adjustment knob 27A is clockwise rotated in the above-mentioned composition according to the situation of hearing a reproduced sound, The pinion gear 25A rotates clockwise, the rack 24A fixed to the locking plate 22A which engages with the pinion gear 25A is moved to back on a figure, and as a result, the engaging projection 201A of each louver 2A is moved toward the method of outside, where the inside of the guide hole 23A is regulated.
[0038]
As mentioned already, the guide hole 23A which makes correspond to each louver 2A, and is formed in the locking plate 22A here, Since it is formed so that the angle with the level surface which intersects perpendicularly with the sound radiation side of the ultrasonic wave speakers 1 to make may become large as it goes to a periphery along a perpendicular direction from near the center of the front face of the ultrasonic wave speakers 1, Each louver 2A is set up so that the angle opened towards the method of outside may become large, as it goes to a peripheral part from a center perpendicularly. As a result, the beep outputted from the sound radiation side of the ultrasonic wave

speakers 1 will be diffused in a sliding direction, and will be emitted ahead.
[0039]
On the other hand, if the angle adjustment knob 27B is clockwise rotated where each louver 2A of the 1st louver group 20A is closed. The pinion gear 25B rotates clockwise, the rack 24B fixed to the locking plate 22B which engages with the pinion gear 25B is moved to back on a figure, and as a result, the engaging projection 201B of each louver 2B is moved toward the method of outside, where the inside of the guide hole 23B is regulated.
[0040]
The guide hole 23B which makes correspond to each louver 2B and is formed in the locking plate 22B in the 2nd louver group 20B like the 1st louver group 20A. Since it is formed so that the angle with the vertical plane which intersects perpendicularly with the sound radiation side of the ultrasonic wave speakers 1 to make may become large as it meets horizontally from near the center of the front face of the ultrasonic wave speakers 1 and goes to a periphery, Each louver 2A is set up so that the angle opened towards the method of outside may become large, as it goes to a peripheral part from a center horizontally. As a result, on a figure, the beep outputted from the sound radiation side of the ultrasonic wave speakers 1 will be diffused in the longitudinal direction of the ultrasonic wave speakers 1, and will be emitted ahead.
[0041]
It can adjust in the direction which turns ahead the beep emitted from the ultrasonic wave speakers 1, and is completed by rotating the angle adjustment knobs 27A and 27B counterclockwise conversely according to the situation of hearing a reproduced sound. Comprise this embodiment so that set angles may differ and each louver of the 1st louver group 20A and the 2nd louver group 20B may be adjusted by the louver installed near the center of the front face of the ultrasonic wave speakers 1, and the louver installed in the peripheral part, but. When the angle adjustment knobs 27A and 27 are operated, it may be made for the set angle of a louver to become the same by forming the guide holes 23A and 23B so that it may become an identical angle from a reference position.
[0042]
The appearance composition of the ultrasonic loudspeaker system with which drawing 5 is constituted including two sets of the ultrasonic wave speakers 1A and 1B is shown. These ultrasonic wave speakers 1A and 1B modulate a carrier wave by the signal wave outputted from the signal source which generates the signal wave of an audio frequency belt. By driving an ultrasonic transducer with this modulating signal, it is a loudspeaker which reproduces the beep of an audio frequency belt, and the stereo sound signal of a different channel is reproduced by these loudspeakers 1A and 1B, respectively.
The ultrasonic wave speakers 1A and 1B are stored in the one case 300 up and down, and the louver devices 200A and 200B which counter each ultrasonic wave speakers and become case 300 front face of this from two or more louvers, respectively are installed.
[0043]
The 1st louver group by which the louver devices 200A and 200B were installed in the perpendicular direction in the front face of the ultrasonic wave speakers 1A and 1B, respectively, It consists of the 2nd louver group in the front face of the ultrasonic wave speakers 1A and 1B installed horizontally, and has the angle adjustment knobs 270A, 270B, and 270C as an adjustment device which adjusts independently the set angle of

said 1st and 2nd louver group, respectively.
In the above-mentioned composition, it can spread or converge according to the situation of hearing a reproduced sound, by operating the angle adjusument knobs 270A, 270B, and 270C for each louver which constitutes each louver devices 200A and 200B.
[0044]
According to this embodiment, although the conventional ultrasonic wave speakers had only uses, such as work explanation by a museum, a use spreads also as audio equipment, such as a projector, by sending a sound to a wide angle in this way. A system applicable to both when hearing it by the time of hearing it individually or a lot of people can be built.
[Brief Description of the Drawings]
[0045]
[Drawing 1]The explanatory view showing the outline composition of the ultrasonic wave speakers concerning the embodiment of this invention.
[Drawing 2]The explanatory view showing a relation with angle-of-reflection theta' of the reproduced sound in the set angle theta and the front face of a screen of a louver as which the reproduced sound emitted from the ultrasonic wave speakers concerning the embodiment of this invention is diffused or completed.
[Drawing 3]The figure showing the composition of the ultrasonic wave speakers which require a louver device for the embodiment of this invention installed in the front face.
[Drawing 4]The top view which cut near the center of the ultrasonic wave speakers in drawing 3 in the level surface.
[Drawing 5]The figure showing the appearance composition of the ultrasonic loudspeaker system with which this invention is applied.
[Drawing 6]The block diagram showing the electric constitution of ultrasonic wave speakers.
[Drawing 7]The figure showing the example of composition of a resonance type ultrasonic transducer.
[Drawing 8]The figure showing the composition of the broad frequency band oscillation type ultrasonic transducer of an electrostatic type.
[Drawing 9]The characteristic figure showing the frequency characteristic of an ultrasonic transducer.
[Description of Notations]
[0046]
1, 1A, 1B -- Ultrasonic wave speakers, 2,200A, 200B -- Louver device, 2A, 2B [-- The 2nd louver group,] -- A louver, 3 -- A screen, 20A -- The 1st louver group, 20B 22A, 22B -- A locking plate, 23A, 23B -- A guide hole, 24A, 24B -- Rack, 25A, 25B [-- A case 30A, 30B / -- A side plate 30C / -- A ceiling board 30D / -- Bottom plate] -- A pinion gear, 26A, 26B -- The axis of rotation, 27A, 27B, 270A, 270B, 270C -- An angle adjustment knob, 30, 300